JUNE 3.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-two members present.

Fertilization of Pedicularis Canadensis.—Mr. THOMAS MEEHAN drew attention to the structure of the flower of *Pedicularis Canadensis*, in which it was evident self-impregnation was impossible, and there seemed to be no special arrangements for fertilization by distinct agency, as there were in so many allied plants. In this case the stamens were included in the closely compressed arch of the corolla, and, with the anthers, were directed retrorsely to the pistil, which at an early stage, and long before the maturity of the pollen, was protruded beyond the corolla, rendering self-fertilization almost impossible in this flower. But the flowers were always abundantly fertile, and though the arrangements were such as seemingly to afford no chance even for insects to aid in the fertilization, it was also probable that in some way it was accomplished by them. Both last season and this he had devoted some time to watching the plant, but failed to find any clue to the process. A species of *Bombus* seemed to have the plant especially under its charge, visiting the flowers in great numbers; but they bored through the corolla on the outside of the tube for the saccharine matter, and the anthers or pollen did not seem to be in the least disturbed by this. Still it was so highly probable that in some way some insect aided in the cross-fertilization of these flowers, that it might serve a useful purpose to direct attention to it, as others with time and opportunity might discover what he had failed to find.

JUNE 10.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-two members present.

Mr. GENTRY made the following remarks:—

At the last meeting of the Academy, Mr. Meehan made some observations upon the peculiar structure of the flowers of *Pedicularis canadensis*, observing that he had vainly watched them during two seasons with the view of determining the manner in which they were fertilized. He further said that he had noticed that they received the attention of a species of bumble-bee, for the sake of their honey, which in order to accomplish its purpose always bored a hole into the side of the tube.

On Wednesday morning last, I visited a spot where the plants were growing luxuriantly, affording an interesting field for observation. It was not long before I observed a *Bombus terrestris* to alight upon the outer side of the tube of a flower, at a distance of three feet from me. At this distance it did seem as if the bee in order to obtain the honey which the flower secretes, produced a slit into the tube, as Mr. Meehan observed. But the movements of the bee being so quick, and the distance too great to judge accurately, I approached the insect by degrees, until I was within three inches of it, when the whole process became apparent. The bee, however, was so intent upon its labors, as not to take any notice of me.

The flower is composed of an erect tube, with a natural cleft running along its lateral walls from above, through one-third its entire length, presenting outwardly apparently a mere crease, from the manner in which the compressed margins of the upper lip fit into the rolled-in edges of the lateral lobes of the under lip. The upper lip is compressed, arched, and beaked, presenting an aperture at the apex, through which passes a curved pistil, the lower lip is reflexed, consisting of three lobes, one median and two lateral, assuming a platform arrangement. Enclosed within the upper lip are four stamens, didynamous, with their anthers turning backwards, facing each other ventrally. When ripe these anthers split upon the inner side, thus giving a fancied resemblance to an oval snuff-box, thrown backwards upon its hinges. Each cell is filled with white pollen grains.

Now when the bee alights upon the tube, by means of its trunk, it opens the natural cleft above alluded to, and having thus gained a partial entrance, it would defeat its intention, did not the length of the flower's tube when contrasted with that of the bee's trunk, necessitate the admission of the entire head also. In this operation the lips of the flower are pressed apart, the margins of the upper lip are separated to receive the head, and the pollen grains, already ripe, by the considerable motion to which they are subjected, become dislodged from their cells, and fall down in a dense shower upon the bee's back and head. Having obtained the coveted sweet, it flies to another flower upon a different stalk, as I observed in a score of cases during two days; but before renewing the preceding operations, stations itself awhile upon the lower lip, its head coming in contact with the stigma of the pistil. Then, by means of the hairs that line the inner side of the tarsus of each anterior leg, and the constant rubbing together of the parts comprising its trophi or instrumenta cibaria, the attached pollen grains are sent flying in every direction, sure to adhere to the stigma.

Whilst observing the above process, I also noticed that after the lips had been pressed apart and were permitted to regain their position, the upper lip, being somewhat elastic, sprung back to its place with considerable force, sending through the aperture,

through which passes the pistil, a complete cloud of pollen, enveloping the stigma upon every side.

This operation can be performed artificially, by taking hold of the under lip with the left thumb and fore-finger, and pulling the upper lip backward, by the right, and then releasing the hold of the latter: the upper lip springs to its place, spirting the pollen through the aperture upon the left hand. From the above it is to be seen, that the plant has two chances of being fertilized—one by its own pollen, and the other by that of another. Although the flower seeds abundantly, yet I am disposed to think that it is mainly through the pollen of another that the seeds become perfect. I incline to this opinion because, in an examination of many pods, I noticed that a few seeds were found in a rudimentary condition, apparently manifesting a tendency to abort, while the majority were in a vigorous condition; the former, doubtless, being the effects of self-fertilization in part, which, as is well-known, is a degenerating process.

I desire also to call attention to an interesting discovery which I was enabled to make recently, whilst engaged in an examination of a double flower of *Ranunculus fascicularis*. In the genus Ranunculus, the corolla of a normal flower is made up of five petals, each of which on the inner side of its basal part is usually provided with a scale. This scale from its position is denominated the *nectariferous scale*.

In the specimen under consideration three of these scales had assumed the character of petals, agreeing with the flower's true petals in every particular except size, being but three-fourths the dimension of the latter. It very frequently happens that we find, in examining flowers, parts which we can refer to no organ with which we have become acquainted. They appear to be distinct from any of the whorls which make up a perfect flower, although located among them and attached perhaps to them. All such parts are designated as appendages. Under this category are placed the scales that are characteristic of some species of Crowfoot.

Prof. Lindley thinks that these small appendages are barren stamens united to the bases of the petals. This opinion I think is a just one.

From the facts here indicated it is reasonable to conclude, that the double flowers of the Ranunculus do not always originate by true staminal metamorphosis, but sometimes by scale transformation; also that nectariferous scales when they exist are barren stamens, which favorable conditions may develop into true petals.

Whilst examining several specimens of *Potentilla* canadensis lately, I was struck with the variableness displayed in the number of segments which constituted their outer or calycine whorls. This series in *Potentilla*, as is well known, consists of five sepals, with as many intermediate bractlets.

In the specimens to which I refer, I counted from seven to ten bractlets. This numerical variation I am confident results from the splitting, so to speak, of some or all of the primary bractlets, as specimens were observed which exhibited all the transitional forms, from a slight indentation at the apex to partial and complete division.

JUNE 17.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

Laws of Sex in Juglans nigra.—Mr. THOMAS MEEHAN said he had at various times during the past few years called the attention of the Academy to specimens of numerous plants which illustrated the principle that sex in plants was the result of grades of vitality; or, as it had been suggested, viability; and that this power of life was a mere matter of nutrition; the highest grades of vitality only producing the female sex. Almost any monœcious plants furnished the necessary evidence of the truth of this position, and what he had said or written on the subject had always been done more to direct attention, and to lead others to examine plants themselves, than that the facts were exhausted. He believed that in the main the principle had been so generally accepted by naturalists, that it seemed unnecessary for him to say any more on the subject, but let it now work its own way. At the meeting of the American Association, at Dubuque, last year, which he had not the pleasure of attending, the subject was introduced; and though, as he gathered from the public papers, the principle was to a certain extent admitted, objection was made that possibly the weakened shoot or axis bearing male flowers was a *result* of the production, and if so it would show rather a great expenditure of vital force in their formation, than afford a proof of the principle under discussion. He was astonished at the suggestion at the time, exhibiting as it did, he thought, a careless reading of his papers; as he had stated, and exhibited the facts supporting the statement to the Academy, that, especially in coniferæ, the weakening process had been going on for several seasons prior to the production of male flowers. In the pine and spruce, for instance, he had distinctly stated, that only those branches the most favorably situated to derive the greatest benefit from nutritive forces bore female flowers. These branches in time naturally became shaded by succeeding growths. The partial shade was injurious to perfect nutrition. A few years of these circumstances weakened the branch, *and after being thus weakened*, the male catkins appeared. There were of course other agencies at work besides shade; whatever they were, the result in sex was the same. He did not think